6-2004

Response to Comments on "Passivity-Based Control of Saturated Induction Motors"

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Publication Info

Published in *IEEE Transactions on Industrial Electronics*, Volume 51, Issue 3, 2004, pages 739-739.
http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=41

figure, some additional issues in the development of an AW technique are as follows:

1) when one should engage nonlinear control;
2) what kind of nonlinear control one should use;
3) how to update the integrator state so that the transition from nonlinear operation to linear operation is smooth.

The fundamental issue in the development of an AW control law is that the control loop needs to be viewed as a nonlinear system. The careful investigation of the AWPID plant control loop in terms of a thorough analysis of both nonlinear stability and performance should accompany any AW design.

ACKNOWLEDGMENT

The authors wish to thank Dr. A. R. Tarrer, Auburn University, for his assistance in testing VSPID on a hardware testbed.

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Response to Comments on "Passivity-Based Control of Saturated Induction Motors"

Levent U. Gökdere, Marwan A. Simaan, and Charles W. Brice

***Abstract*—Contrary to the claims made in the comments to our paper, the passivity-based controller developed for induction motors has already been tested on the same demanding trajectories used for the input–output linearization controller. The experimental results show that the passivity-based controller provides closer tracking of the same mechanical trajectory, when compared with the input–output linearization controller.**

***Index Terms*—Induction motor, input–output linearization method, passivity-based method.**

The comments in [1] are misleading and incorrect. Contrary to what is mentioned in these comments, there is no comparison between the passivity-based and input–output linearization controllers in [2]. The comparison is between the two passivity-based controllers, one of which takes into account the saturation of the magnetic material in the main flux path of the induction motor while the other does not. Also, this is done by using a demanding speed reversal move which drives the motor well into the magnetic saturation region.

On the other hand, the passivity-based controller [3], [4] has already been tested on the same test setup and also using the same demanding time-varying speed/position/flux trajectories and motor parameters as in [5] and [6]. The experimental results in [3] and [4] show that the use of the passivity-based controller results in reduced position tracking errors as compared with the input–output linearization controller for the same demanding mechanical trajectory in [5] and [6]. This was also clearly stated in [7].

The claim in [1] that the only difference between the passivity-based controller and the input–output linearization controller is simple replacement of the estimated flux with the reference flux in the code earlier developed in [5] and [6] cannot be justified. A close look at the definitions of the two controllers and the way they are implemented show substantial differences. For example, feedforward terms existing in the passivity-based controller for better tracking of the time-varying reference flux trajectories and also different coordinate transformations implemented in the passivity-based controller are only two of the differences. Most of all, the study in [2] is based on the work in [3] and the reader should refer to [3] for a better insight into passivity-based control of induction motors.

Editor's Note: This response did not appear in the same issue as the comments [1] since the authors of the response had not been aware of the comments until the comments were published in the August 2003 issue of the IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS. The authors of the response would like to thank the previous Editor-in-Chief, Prof. F. Harashima, for giving them the opportunity to publish their response through the review.

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Manuscript received August 31, 2003; revised November 25, 2003. Abstract published on the Internet January 14, 2004.

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Digital Object Identifier 10.1109/TIE.2004.827468